

GRADIENT CATHODE MATERIAL
FOR LITHIUM RECHARGEABLE BATTERIES

ABSTRACT OF THE DISCLOSURE

A composition suitable for use as a cathode material of a lithium battery includes

- 5 a core material having an empirical formula $\text{Li}_x\text{M}'_z\text{Ni}_{1-y}\text{M}''_y\text{O}_2$. "x" is equal to or greater than about 0.1 and equal to or less than about 1.3. "y" is greater than about 0.0 and equal to or less than about 0.5. "z" is greater than about 0.0 and equal to or less than about 0.2. M' is at least one member of the group consisting of sodium, potassium, nickel, calcium, magnesium and strontium. M" is at least one member of the group
- 10 consisting of cobalt, iron, manganese, chromium, vanadium, titanium, magnesium, silicon, boron, aluminum and gallium. A coating on the core has a greater ratio of cobalt to nickel than the core. The coating and, optionally, the core can be a material having an empirical formula $\text{Li}_{x_1}\text{A}_{x_2}\text{Ni}_{1-y_1-z_1}\text{Co}_{y_1}\text{B}_{z_1}\text{O}_a$. "x1" is greater than about 0.1 and equal to or less than about 1.3. "x2," "y1" and "z1" each is greater than about 0.0 and equal to or less than about 0.2. "a" is greater than 1.5 and less than about 2.1. "A" is at least one element selected from the group consisting of barium, magnesium, calcium and strontium. "B" is at least one element selected from the group consisting of boron, aluminum, gallium, manganese, titanium, vanadium and zirconium.
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